IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	H. Komobuchi et al.	: Art Unit:
Serial No.:	To Be Assigned	: Examiner:
Filed:	Herewith	:
FOR:	SOLID STATE IMAGE PICKUP DEVICE AND ITS DRIVING METHOD USING TWO DIFFERENT PERIODS	:

DIVISIONAL OF:

Applicant:	H. Komobuchi et al.	: Art Unit: 2712
Serial No.:	08/918,424	: Examiner: L. Nguyen
Filed:	August 26, 1997	:
FOR:	SOLID STATE IMAGE PICKUP DEVICE AND ITS DRIVING METHOD USING TWO DIFFERENT PERIODS IN A FIELD OR FRAME	:

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

S I R :

Prior to examination, please amend the above-identified application as follows.

IN THE TITLE:

Please delete the title in its entirety and substitute therefor --SOLID STATE IMAGE PICKUP DEVICE AND ITS DRIVING METHOD USING TWO DIFFERENT PERIODS--.

IN THE SPECIFICATION:

On page 1, please insert before the first line, --This application is a division of U.S. Patent Application No. 08/918,424, filed August 26, 1997, which is a division of U. S. Patent Application. No. 08/726,337, filed October 3, 1996, which is a continuation of U. S. Application No. 08/261,841, filed June 17, 1994.--

Please replace the paragraph beginning at page 1, line 5 with the following:

The present invention relates to a solid state image pickup device for expanding the management range in the quantity of incident light to the high-luminance side and a method for driving the same, and in particular, to a solid state image pickup device for expanding the management range of the quantity of incident light by setting up at least two signal charging periods in the specified period represented by the field or frame of a video signal and reproducing the signal charges in the signal charging period without using any external field memory or any frame memory and a method for driving the same.

Please replace the paragraph beginning at page 1, line 18 with the following:

According to a conventional technique, at least two mutually different charging periods are set in one frame or one field in expanding the management range in the quantity of incident light. For example, a first charging period T1 corresponding to the conventional vertical scanning period and a second charging period T2 shorter than the first charging period in the vertical blanking period are set in one field period TF. Then a signal charge Q1 obtained in the first charging period is reproduced with a gain of 1, and a signal charge Q2 obtained in the second charging period is reproduced with a gain (T1/T2). As a result, when the signal charge Q1 reaches a saturation charge quantity, a management range in quantity of incident light being (T1/T2) times greater than the gain in the conventional case is achieved using the signal information of the signal charge Q2.

Please replace the paragraph beginning at page 2, line 15 with the following:

In the above-mentioned element drive method for expanding the management range in the quantity of incident light, there is a proposal for dispensing with any external frame memory (Japanese Patent Laid-Open Publication No. SHO 63-250980). The above-mentioned proposal describes a method for continuously transferring signal charges obtained in two charging periods separately provided in one field period TF in a vertical CCD by producing three signal packets with four pixels and a total of eight transfer electrodes according to the structure of the current CCD, using signal charges of a mixture of two pixels in the first charging period as two packets, and using signal charges of a mixture of four pixels in the second charging period as one packet.

Please replace the paragraph beginning at page 3, line 9 with the following:

However, it is required to read two times during a time interval of T for the purpose of additively mixing the signal charges of the mixture of four pixels. There exist two different types of signal charges T2 and (T2 + T) in an identical packet. When the signal charges of the mixture of four pixels in the two types of charging periods are mutually different in time by T are subjected to calculation processing with the gain of (T1/T2) without distinction, there occurs disadvantages such as misalignment in color and misalignment in luminance when adjusting the second charging period T2 according to the quantity of light of the subject.

Please replace the paragraph beginning at page 4, line 1 with the following:

By using a drive method and solid state image pickup device free of the difference of T between charging periods in the second charging period T2 that causes problems when signal charges are read from a photoelectric converting element to a vertical CCD at least two times in one field period, the management range in the quantity of incident light can be expanded. Therefore, misalignment in color and misalignment in luminance can be avoided.

Please replace the paragraph beginning at page 4, line 9 with the following:

The management range in quantity of incident light can be expanded to the high-luminance side without using any external field memory or any frame memory for a subject having a wide range of distribution in luminance by managing the quantity of light smaller than a standard quantity of light and the quantity of light about two times greater than the standard quantity of light with the first charging period T1 and managing a region having a saturation charge quantity in the first charging period T1 with the second charging period T2 in the vertical blanking period.

Please replace the paragraph beginning at page 6, line 9 with the following:

Four transfer electrodes of a VCCD 110 correspond to a unit pixel 100, while eight transfer electrodes of V1 transfer electrode 101, V2 transfer electrode 102, V3 transfer electrode 103, V4 transfer electrode 104, V5 transfer electrode 105, V6 transfer electrode 106, V7 transfer electrode 107, and V8 transfer electrode 108 are used as a total of eight transfer electrodes which correspond to two continuous unit pixels, when an 8-phase transfer clock is applied to them. The V2 transfer electrode 102 and the V6 transfer electrode 106 are each provided with a read gate 109. Although two read gates are provided for one read electrode by means of a polysilicon of the first layer, the read electrode may utilize the polysilicon of either the first layer or the second layer. It is also permitted to consider that adjoining two pixels in the direction of the VCCD as one pixel in the case where the conventional CCD is used. For the element drive examples in Fig. 2 and subsequent figures, a description is provided based on the structure of Fig. 1.

Please replace the paragraph beginning at page 7, line 16 with the following:

The odd-line pixel 232 and the even-line pixel 233 are preliminarily made to have charge period start timing which are caused to coincide using a known electronic shuttering operation (VOD (vertical overflow drain shuttering operation) sweep).

Please replace the paragraph beginning at page 7, line 20 with the following:

The even-line pixel 233 obtains an even-line first signal charge 205 according to a signal input in a period T11 224. An operation of read to the VCCD is executed with timing TAF1 210. Meanwhile, the odd-line pixel 232 obtains an odd-line first signal charge 206 according to a signal input in a period T12 225, and an operation of read to the VCCD is executed with timing TAF21 211. Further in a V-blank period 202, the even-line pixel 233 obtains an even-line second signal charge 207 according to a signal input in a period T2 227. An operation of read to the VCCD is executed with timing TAS1 212. Meanwhile, the odd-line pixel 232 obtains an odd-line second signal charge 208 according to a signal input in a period T2 228 set up in an identical charging period with the period T2 227, and an operation of read to the VCCD is executed with timing TAS21 213. As a result, control of the charging times in the period T2 227 and the period T2 228 executed for the purpose of picking up a region having a high luminance of the subject in the V-blank period 202 is executed by adjusting a VOD-sweep period 229 provided within the entire field period 226.

Please replace the paragraph beginning at page 10, line 11 with the following:

Incident light is photo-electrically converted in a one-unit pixel photoelectric converter section 300. Meanwhile, an electronic shuttering time two-pixel mixture signal charge 301, a field signal charge 1 302, and a field signal charge 2 303 are transferred respectively by HCCD1 304, HCCD2 305, and HCCD3 306. After passing through a CDs & clamp circuit 307, they are subjected to decision of signal saturation by a signal decision circuit 309 based on the saturation or unsaturation condition of signals output from all or a part of the HCCD1, 2, and 3. After being further subjected to selection of output in a signal selector circuit 308, they are subjected to calculation processing as described hereinafter in a signal processing circuit 310 to execute image signal reproduction.

Please replace the paragraph beginning at page 11, line 4 with the following:

An exemplified image reproducing method is shown. In the following conditional expressions, VT represents a voltage corresponding to the saturation charge quantity of an element.

Please replace the paragraph beginning at page 12, line 11 with the following:

An output signal charge quantity obtained by the read and transfer operations through mixture of two pixels in a conventional CCD is shown as a conventional two-pixel mixture type saturation electric charge quantity 320. The saturation charges quantity of signal charges in the charging periods T11 224 and T12 225 shown in Fig. 2 (a) come to have a value corresponding to one transfer electrode in one unit pixel in one unit pixel 100 shown in Fig. 1, and therefore the value is one fourth of the conventional two-pixel mixture type saturation electric charge quantity. In forming a luminance signal, a signal charge 240 and a signal charge 241 are added together in an external circuit, and therefore the value is half of the conventional two-pixel mixture type saturation charge quantity. The value is shown as all pixel independent read time saturation electric charge quantity 321.

Please replace the paragraph beginning at page 13, line 9 with the following:

According to the element and drive method of the present embodiment, a signal charge obtained by mixing the even-line second signal charge 207 in the charging period T2 227 with the odd-line second signal charge 208 in the charging period T2 228 can be independently read simultaneously, and therefore an electronic shuttering two-pixel mixing time saturation electric charge quantity 322 can be obtained. In this place, the periods T2 227 and T2 228 can be varied, for example, from 1/500 of a second to 1/2000 of a second to allow an effect as represented by variable 325 in Fig. 6 to be obtained. Therefore, a management incident light quantity expansion range 323 greater than a conventional management incident light quantity upper limit 324 can be achieved.

Please replace the paragraph beginning at page 14, line 7 with the following:

In this case, the charging period start timings of the odd-line pixel 432 and the even-line pixel 433 differ from each other. The even-line pixel 433 obtains an even-line first signal charge 405 according to a signal input in a period T11 424. An operation of read to the VCCD is executed with timing TAF1 410. Meanwhile, the odd-line Pixel 432 obtains an odd-line first signal charge 406 According to a signal input in a period T12 425, and an Operation of read to the VCCD is executed with timing TAF21 411. Further in a V-blank period 402, the even-line pixel 433 obtains an even-line second signal charge 407 according To a signal input in a period T2 427. An operation of read To the VCCD is executed with timing TAS1 412. Meanwhile, The odd-line pixel 432 obtains an odd-line second signal Charge 408 according to a signal input in a period T2 428 set in an identical charging period with the period T2 427, and an operation of read to the VCCD is executed with Timing TAS21 413. In this place, the periods T11 424 and T12 425 differ from each other and also differ depending on whether they are in the A-FIELD 401 or in the B-FIELD 403. Therefore, when the periods T2 427 and T2 428 having the Same charging time are controlled, there is a possibility of Generating misalignment in color and misalignment in Luminance in the period of four fields. However, the pixel data are read independently in the present invention, a calculation (Equation 6) which takes the ratio in charging period (Equation 5) into account can be allowed. Therefore, by using a value Vsig' (T11) calculated in terms of the charging period T12, neither misalignment in color nor misalignment in luminance takes place.

IN THE CLAIMS:

Please delete claims 1-8.

Please add claims 9-18 as follows:

9. (Newly Added) A method for driving a solid state image pickup device having a plurality of unit pixel means where each one of the plurality of unit pixel means corresponds to a pixel means having at least one input converting section, and CCD electric charge transfer means, the method comprising the steps of:

setting only a single first signal charging period and only a single second signal charging period for each one of the plurality of unit pixel means, where the single second signal charging period occurs after the single first signal charging period and is shorter than the single first signal charging period;

setting the single first signal charging period of a first unit pixel means and the single first charging period of a second unit pixel means so that the single first signal charging periods for the first and second unit pixel means have coinciding start times, the first and second unit pixel means are adjacent to each other in a vertical direction;

setting the single second signal charging period of the first unit pixel means and the single second signal charging period of the second unit pixel means so that the single second signal charging periods for the first and second unit pixel means have different start times and similar time duration during which a second signal charge is produced within each unit pixel means; and

adding the second signal charge of the first unit pixel means to the second signal charge of the second unit pixel means for output by the CCD electric charge transfer means.

10. (Newly Added) The method for driving a solid state image pickup device according to claim 9 wherein the second signal charging period is controlled using an electronic shuttering operation.

11. (Newly Added) A method for driving a solid state image pickup device having a plurality of unit pixel means where each one of the plurality of unit pixel means corresponds to a pixel means having at least one input converting section, and CCD electric charge transfer means, the method comprising the steps of:

setting only a single first signal charging period and only a single second signal charging period for each one of the plurality of unit pixel means, where the single second signal charging period occurs after the single first signal charging period and is shorter than the single first signal charging period;

setting the single second signal charging period of a first unit pixel means and the single second signal charging period of a second unit pixel means so that the single second signal charging periods for the first and second unit pixel means have different start times and similar time duration during which a second signal charge is produced within each unit pixel means, the first and second unit pixel means are adjacent to each other in a vertical direction; and

adding the second signal charge of the first unit pixel means to the second signal charge of the second unit pixel means for output by the CCD electric charge transfer means

12. (Newly Added) The method for driving a solid state image pickup device according to claim 11, wherein the second signal charging period is controlled using an electronic shuttering operation.

13. (Newly Added) A solid state image pickup device comprising:

a plurality of unit pixel means arranged in a two dimensional matrix with a horizontal axis and a vertical axis where each one of said plurality of unit pixel means corresponds to one pixel in an image, each one of said plurality of unit pixel means comprising:

(1) at least one input converting section,

(2) CCD electric charge transfer means, and

(3) four transfer electrodes;

wherein eight transfer electrodes are provided for two unit pixel means adjacent to each other in a vertical direction;

pulse generating means for driving the eight transfer electrodes;

means for setting a first signal charging period and a second signal charging period for each one of the plurality of unit pixel means, where the second

signal charging period occurs after the first signal charging period and is shorter than the first signal charging period;

means for setting the second signal charging period for the two unit pixel means which are adjacent to each other in the vertical direction so that the second signal charging period for each of the two unit pixel means have different start times and similar time durations; and

means for adding signal charges of the two unit pixel means from the second charging periods.

14. (Newly Added) A method for driving a solid state image pickup device, the method comprising the steps of:

(a) setting a first signal charging period and a second signal charging period for each one of a plurality of unit pixel means, the plurality of unit pixel means being arranged in a matrix with horizontal rows, where the second signal charging period is shorter than the first signal charging period and a first signal charge is produced during the first signal charging period and a second signal charge is produced during the second signal charging period;

wherein the second signal charges of pairs of unit pixel means which are vertically adjacent are added;

(b) enlarging the second signal charge.

15. (Newly Added) The method for driving a solid state image pickup device according to claim 14, wherein when an electric charge is transferred using a vertical CCD electric charge transfer means having four electrodes provided for one unit pixel, the first signal charge obtained during the first signal charging period and the second signal charge obtained during the second signal charging period are transferred existing together in said vertical CCD electric charge transfer means.

16. (Newly Added) The method for driving a solid state image pickup device according to claim 14, wherein when an electric charge is transferred using a vertical CCD electric charge transfer means having four electrodes provided for one unit pixel, the first signal charge obtained during the first signal charging period and the second signal charge obtained during the second signal charging period are transferred existing together in said vertical CCD electric charge transfer means.

17. (Newly Added) The method for driving a solid state image pickup device according to claim 14, wherein the second signal charge step (b) is enlarged in proportion to a ratio of the first signal charging period to the second signal charging period.

18. (Newly Added) The method for driving a solid state image pickup device according to claim 14, wherein step (b) includes the step of judging whether the first signal charge is saturated or not saturated.

IN THE ABSTRACT:

Delete the abstract in its entirety and substitute therefor the revised abstract which appears on a separate sheet..

Respectfully Submitted,

Allan Ratner, Reg. No. 19,717
Lowell Carson, Reg. No. 48,548
Attorneys for Applicants

AR/jam

Enclosure: Version with markings to show changes made
Revised Abstract

Dated: January 10, 2002
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The Assistant Commissioner for Patents is hereby authorized to charge payment to Deposit Account No. **18-0350** of any fees associated with this communication.
EXPRESS MAIL Mailing Label Number: EV 050914417 US
Date of Deposit: January 10, 2002

I hereby certify that this paper and fee are being deposited, under 37 C.F.R. § 1.10 and with sufficient postage, using the "Express Mail Post Office to Addressee" service of the United States Postal Service on the date indicated above and that the deposit is addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

Kathleen Libby

Kathleen Libby

ABSTRACT

A method and apparatus for driving a solid state image pickup device. The method and apparatus include setting a first signal charging period and a second signal charging period for each one of a plurality of unit pixels. The second signal charging period is shorter than the first signal charging period. A first signal charge is produced during the first signal charging period and a second signal charge is produced during the second signal charging period. It is judged whether the first signal charge is saturated or not saturated. Then based on this judgment an input light amount is determined. The input light amount is determined using only the second signal charge when the first signal charge is saturated. The input light amount is determined using only the first signal charge when the first signal charge is not saturated.

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE TITLE:

~~SOLID STATE IMAGE PICKUP DEVICE AND ITS DRIVING METHOD USING TWO DIFFERENT PERIODS IN A FIELD OR FRAME~~

SOLID STATE IMAGE PICKUP DEVICE AND ITS DRIVING METHOD USING TWO DIFFERENT PERIODS

IN THE SPECIFICATION:

This application is a division of U.S. Patent Application No. 08/918,424, filed August 26, 1997, which is a division of U. S. Patent Application. No. 08/726,337, filed October 3, 1996, which is a continuation of U. S. Application No. 08/261,841, filed June 17, 1994.

Specification at page 1, line 5:

The present invention relates to a solid state image pickup device for expanding the management range in the quantity of incident light to the high-luminance side and a method for driving the same, and in particular, to a solid state image pickup device for expanding the management range ~~in~~ of the quantity of incident light ~~to the high-luminance side~~ by setting up at least two signal charging periods in ~~a~~ the specified period represented by the field or frame of a video signal and reproducing the signal charges in the signal charging period without using any external field memory or any frame memory and a method for driving the same.

Specification at page 1, line 18:

According to a conventional technique, at least two mutually different charging periods are set ~~up~~ in one frame or one field in expanding the management range in the quantity of incident light. For example, a first charging period T1 corresponding to the conventional vertical scanning period and a second charging period T2 shorter than the first charging period in the vertical blanking period are set ~~up~~ in one field period TF. Then a signal charge Q1 obtained in the first charging period is reproduced with a gain of 1, and a signal charge Q2 obtained in the second charging period is reproduced with a gain (T1/T2). ~~In this place~~ As a result, when the signal charge Q1 reaches a saturation

charge quantity, a management range in quantity of incident light being (T1/T2) times greater than the gain in the conventional case is ~~consequently~~ achieved ~~by~~ using the signal information of the signal charge Q2.

Specification at page 2, line 15:

In ~~regard to~~ the above-mentioned element drive method for expanding the management range in the quantity of incident light, there is a proposal ~~of~~ for dispensing with any external frame memory (Japanese Patent Laid-Open Publication No. SHO 63-250980). The above-mentioned proposal describes a method for continuously transferring signal charges obtained in two charging periods ~~dividedly~~ separately provided in one field period TF in a vertical CCD by producing three signal packets with four pixels and a total of eight transfer electrodes according to the structure of the current CCD, using signal charges of a mixture of two pixels in the first charging period as two packets, and using signal charges of a mixture of four pixels in the second charging period as one packet.

Specification at page 3, line 9:

However, it is required to read two times ~~at~~ during a time interval of T for the purpose of ~~addingly~~ additively mixing the signal charges of the mixture of four pixels~~,~~. ~~there~~ There exist two different types of signal charges T2 and (T2 + T) in an identical packet. When the signal charges of the mixture of four pixels in the two types of charging periods are mutually different in time by T are subjected to calculation processing with the gain of (T1/T2) without distinction, there occurs disadvantages such as misalignment in color and misalignment in luminance ~~in~~ when adjusting the second charging period T2 according to the quantity of light of the subject.

Specification at page 4, line 1:

By ~~proposing~~ using a drive method and solid state image pickup device free of the difference of T between charging periods in the second charging period T2 that ~~is problematic~~ causes problems when signal charges are read from a photoelectric converting element to a vertical CCD at least two times in one field period, the management range in the quantity of incident light can be expanded. ~~producing neither~~ Therefore, misalignment in color ~~nor~~ and misalignment in luminance can be avoided.

Specification at page 4, line 9:

The management range in quantity of incident light can be expanded to the high-luminance side without using any external field memory or any frame memory for a subject having a wide range of distribution in luminance by managing the quantity of light smaller than a standard quantity of light and the quantity of light about two times greater than the standard quantity of light with the first charging period T1 and managing a region ~~of the subject which has comes to have~~having a saturation charge quantity in the first charging period T1 with the second charging period T2 in the vertical blanking period.

Specification at page 6, line 9:

Four transfer electrodes of a VCCD 110 correspond to a unit pixel 100, while eight transfer electrodes of V1 transfer electrode 101, V2 transfer electrode 102, V3 transfer electrode 103, V4 transfer electrode 104, V5 transfer electrode 105, V6 transfer electrode 106, V7 transfer electrode 107, and V8 transfer electrode 108 are used as ~~totally~~ a total of eight transfer electrodes ~~to~~ which correspond to two continuous unit pixels, when an 8-phase transfer clock is applied to them. The V2 transfer electrode 102 and the V6 transfer electrode 106 are each provided with a read gate 109. Although two read gates are provided for one read electrode by means of a polysilicon of the first layer, the read electrode may utilize the polysilicon of either the first layer or the second layer. It is also permitted to consider that adjoining two pixels in the direction of the VCCD as one pixel in the case where the conventional CCD is used. For the element drive examples in Fig. 2 and subsequent figures, a description is provided based on the structure of Fig. 1.

Specification at page 7, line 16:

The odd-line pixel 232 and the even-line pixel 233 are preliminarily made to have ~~coincided~~ charge period start timing ~~by~~ which are caused to coincide using a known electronic shuttering operation (VOD (vertical overflow drain shuttering operation) sweep).

Specification at page 7, line 20:

The even-line pixel 233 obtains an even-line first signal charge 205 according to a signal input in a period T11 224. An operation of read to the VCCD is executed with

timing TAF1 210. Meanwhile, the odd-line pixel 232 obtains an odd-line first signal charge 206 according to a signal input in a period T12 225, and an operation of read to the VCCD is executed with timing TAF21 211. Further in a V-blank period 202, the even-line pixel 233 obtains an even-line second signal charge 207 according to a signal input in a period T2 227. An operation of read to the VCCD is executed with timing TAS1 212. Meanwhile, the odd-line pixel 232 obtains an odd-line second signal charge 208 according to a signal input in a period T2 228 set up in an identical charging period with the period T2 227, and an operation of read to the VCCD is executed with timing TAS21 213. ~~In this place~~As a result, control of the charging times in the period T2 227 and the period T2 228 executed for the purpose of picking up a region having a high luminance of the subject in the V-blank period 202 is executed by adjusting a VOD-sweep period 229 provided within the entire field period 226.

Specification at page 10, line 11:

Incident light is photo-electrically converted in a one-unit pixel photoelectric converter section 300. Meanwhile, an electronic shuttering time two-pixel mixture signal charge 301, a field signal charge 1 302, and a field signal charge 2 303 are transferred respectively by HCCD1 304, HCCD2 305, and HCCD3 306. After passing through a CDs & clamp circuit 307, they are subjected to decision of signal saturation by a signal decision circuit 309 based on the saturation or unsaturation condition of signals output from all or a part of the HCCD1, 2, and 3. After being further subjected to selection of output in a signal selector circuit 308, they are ~~put~~ subjected to calculation processing as described hereinafter in a signal processing circuit 310 to execute image signal reproduction.

Specification at page 11, line 4:

~~Then an~~An exemplified image reproducing method is shown. In the following conditional expressions, VT represents a voltage corresponding to the saturation charge quantity of an element.

Specification at page 12, line 11:

An output signal charge quantity obtained by the read and transfer operations through mixture of two pixels in a conventional CCD is shown as a conventional two-pixel mixture type saturation electric charge quantity ~~302~~320. The saturation charges

quantity of signal charges in the charging periods T11 224 and T12 225 shown in Fig. 2 (a) come to have a value corresponding to one transfer electrode in one unit pixel in one unit pixel 100 shown in Fig. 1, and therefore the value is one fourth of the conventional two-pixel mixture type saturation electric charge quantity. In forming a luminance signal, a signal charge 240 and a signal charge 241 are added together in an external circuit, and therefore the value is half of the conventional two-pixel mixture type saturation charge quantity. The value is shown as all pixel independent read time saturation electric charge quantity 321.

Specification at page 13, line 9:

According to the element and drive method of the present embodiment, a signal charge obtained by mixing the even-line second signal charge 207 in the charging period T2 227 with the odd-line second signal charge 208 in the charging period T2 228 can be independently read simultaneously, and therefore an electronic shuttering ~~tow-pixel~~two-pixel mixing time saturation electric charge quantity 322 can be obtained. In this place, the periods T2 227 and T2 228 can be varied, for example, from 1/500 of a second to 1/2000 of a second to allow an effect as represented by variable 325 in Fig. 6 to be obtained. Therefore, a management incident light quantity expansion range 323 greater than a conventional management incident light quantity upper limit 324 can be achieved.

Specification at page 14, line 7:

In this case, the charging period start timings of the odd-line pixel 432 and the even-line pixel 433 differ from each other. The even-line pixel 433 obtains an even-line first signal charge 405 according to a signal input in a period T11 424. An operation of read to the VCCD is executed with timing TAF1 410. Meanwhile, the odd-line Pixel 432 obtains an odd-line first signal charge 406 According to a signal input in a period T12 425, and an Operation of read to the VCCD is executed with timing TAF21 411. Further in a V-blank period 402, the even-line pixel 433 obtains an even-line second signal charge 407 according To a signal input in a period T2 427. An operation of read To the VCCD is executed with timing TAS1 412. Meanwhile, The odd-line pixel 432 obtains an odd-line second signal Charge 408 according to a signal input in a period T2 428 set ~~up~~ in an identical charging period with the period T2 427, and an operation of read to the VCCD is executed with Timing TAS21 413. In this place, the periods T11 424 and T12 425 differ from each other and also differ depending on whether they are in the A-FIELD 401 or in the B-FIELD 403. Therefore, when the periods T2 427 and T2 428 having the

Same charging time are controlled, there is a possibility of Generating misalignment in color and misalignment in Luminance in the period of four fields. However, the pixel data are read independently in the present invention, a calculation (Equation 6) which takes the ratio in charging period (Equation 5) into account can be allowed. Therefore, by using a value Vsig' (T11) calculated in terms of the charging period T12, neither misalignment in color nor misalignment in luminance takes place.

IN THE CLAIMS:

Claims 1-8 have been cancelled.

Claims 9-18 have been added.

IN THE ABSTRACT:

~~Incident light is photoelectrically converted in a one-unit pixel photoelectric converter section 300, while an electronic shuttering time two pixel mixture signal charge 301, a field signal charge 1 302, and a field signal charge 2 303, are transferred respectively with 8-phase clock by HCCD1 304, HCCD2 305, and HCCD3 306. After passing through a CDS & clamp circuit 307, they are subjected to a decision of signal saturation by a signal decision circuit 309. After having their outputs selected by a signal selector circuit 308, they are subjected to calculating processing in a signal processing circuit 310 to execute image signal reproduction.~~

A method and apparatus for driving a solid state image pickup device. The method and apparatus include setting a first signal charging period and a second signal charging period for each one of a plurality of unit pixels. The second signal charging period is shorter than the first signal charging period. A first signal charge is produced during the first signal charging period and a second signal charge is produced during the second signal charging period. It is judged whether the first signal charge is saturated or not saturated. Then based on this judgment an input light amount is determined. The input light amount is determined using only the second signal charge when the first signal charge is saturated. The input light amount is determined using only the first signal charge when the first signal charge is not saturated.